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Power Plants

PENNSYLVANIA WATER
AND
POWER COMPANY



DESCRIPTION AND VIEWS

PENNSYLVANIA WATER

AND

POWER COMPANY



DESCRIPTION AND VALUE

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CCA



Power House.

Transformer House.

Tail Race

Pennsylvania Water and Power Company

Executive Offices

24 EXCHANGE PLACE

NEW YORK

POWER DEVELOPMENT, HOLTWOOD, PA.

OFFICE OF ENGINEERING DEPARTMENT

U. S. FIDELITY AND GUARANTY BLDG., BALTIMORE, MD.

Capitalization

BONDS

First Mortgage Thirty-Year Five per Cent. Sinking Fund Gold Bonds

Authorized	\$12,500,000.00
Issued	7,930,000.00

Denomination, \$1,000 = £205 9s. 8d.

Principal and interest payable in gold coin of the United States at the

KNICKERBOCKER TRUST COMPANY, NEW YORK

MONTREAL TRUST CO., MONTREAL

In Sterling at the BANK OF SCOTLAND, LONDON

STOCK

All One Class

Authorized	\$8,500,000.00
Issued	8,495,000.00

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CHAS. E. F. CLARKE, Vice-Pres. and Treas.

R. M. SMITH, Secretary

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Power Plant.

Pennsylvania Water and Power Company.

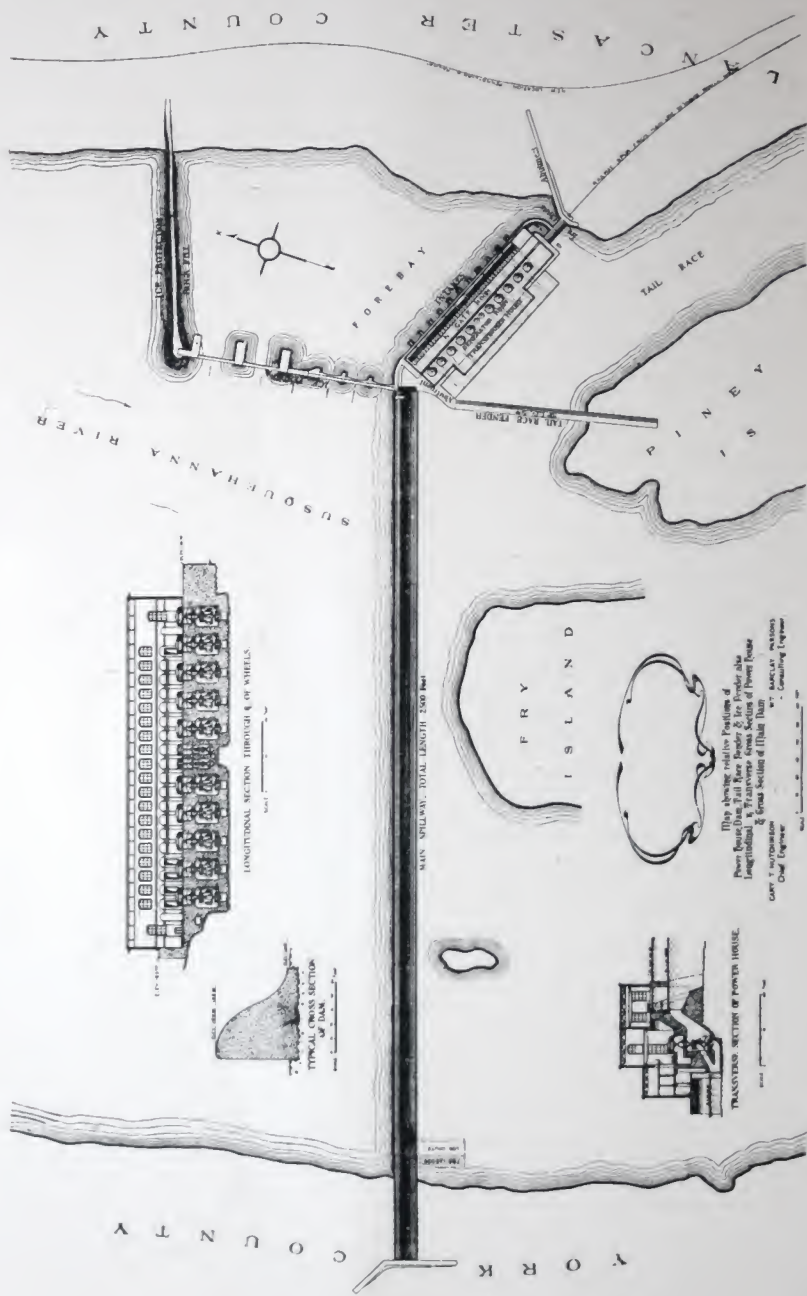
A CORPORATION of the State of Pennsylvania, was organized in January 1910, under the provisions of an Act of Assembly of the Commonwealth of Pennsylvania, approved the 31st day of May, 1887, as amended April 27th, 1909. Said corporation was formed for the purpose of the storage and transportation of water and water power for commercial and manufacturing purposes.

Location.

THE power development of the Pennsylvania Water and Power Company is located at Holtwood, Pa., on the Susquehanna River, about 10 miles northwest of the boundary line between Pennsylvania and Maryland and about 20 miles from the tide-water of the Chesapeake Bay. For construction purposes the site was highly favorable, on account of the steep banks on each side of the river. A large island in the mid-stream and a narrow gorge between the eastern bank and chain of islands which forms a natural tailrace. A fall in the river due to a series of rapids above this point made available for hydraulic purposes a total head of about 63 feet. From the standpoint of an accessible market for current, no better location could be found. Within a radius of 75 miles there is at the present time over 750,000 H. P. being developed by steam.

Susquehanna River.

NEXT to the St. Lawrence River, the Susquehanna River is the largest stream flowing into the North Atlantic. The river finds its source in northern New York and Pennsylvania, and the total area drained is about 27,000 square miles. Over this tremendous area the natural precipitation is approximately 42 inches. It is evident, therefore, that from such an amount of water an enormous volume of power can be developed.



Map showing relative positions of
 Power House Dam Tail Race Tunnel & Lock
 Longitudinal & Transverse sections of Power House
 Cross section of Fry Island
 GARY - ARCHITECT
 CHIEF ENGINEER

TRANVERSE SECTION OF POWER HOUSE.

LONGITUDINAL SECTION THROUGH A OF WHIRLS.

TYPICAL CROSS SECTION OF DAM.

Construction.

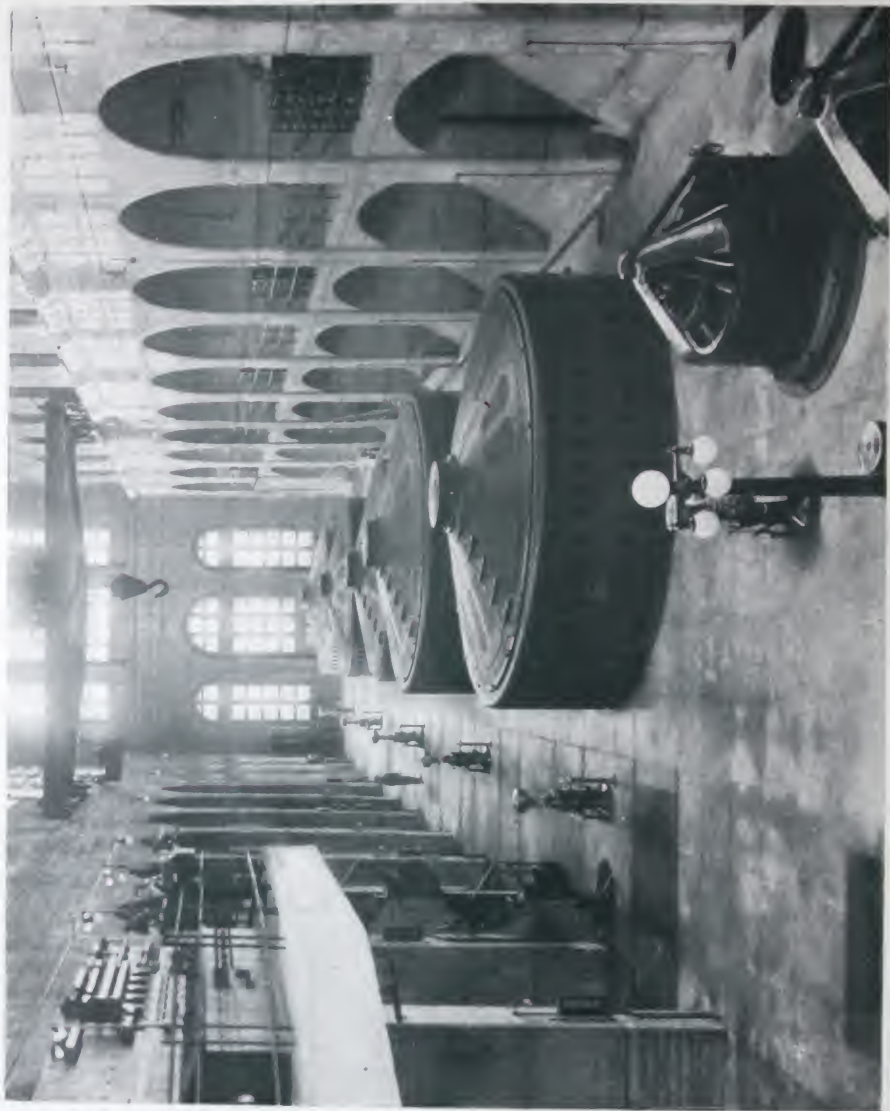
THE DAM.

THE dam, half a mile in length and the second longest dam in the world, is built of solid concrete, with an average height of 55 feet and a width at the base of 65 feet. The down stream face presents a curved surface in order to prevent erosion. To allow for expansion and contraction, layers of compressible material are introduced at intervals of 40 feet. Any danger of cracking or deformation due to internal strain, is thus obviated. The dam backs up the water for a considerable distance up stream, making an artificial lake or storage reservoir of an area of over three square miles. By means of four foot flashboards on the dam we have not only increased materially this storage, but have gained, what is of far more value, an additional head of four feet.

THE POWER HOUSE.

The Power House, also built of solid concrete and connecting the eastern end of the dam to the shore, is 500 feet long and provides space for 10 units, with a total maximum electrical capacity of over 120,000 H. P. The foundations of both the Dam and Power House rest on the bed-rock of the river. To guard against ice, a prolific source of trouble for Power Plants, elaborate precautions have been taken. In the first place, the flow of the river is westward and carries most of the ice away from the Power House. A wing dam having three submerged arches through which water enters the Forebay, built at right angles to the main dam, between which and a rock fill above, there are floating booms, serves to deflect such ice as is carried to the east.

Finally, to dispose of any ice, which, in spite of these safeguards, may get into the Forebay as well as ice which may form there, three ice chutes have been built into the Power House. Danger of interruption to the service caused by ice has thus been reduced to a minimum.

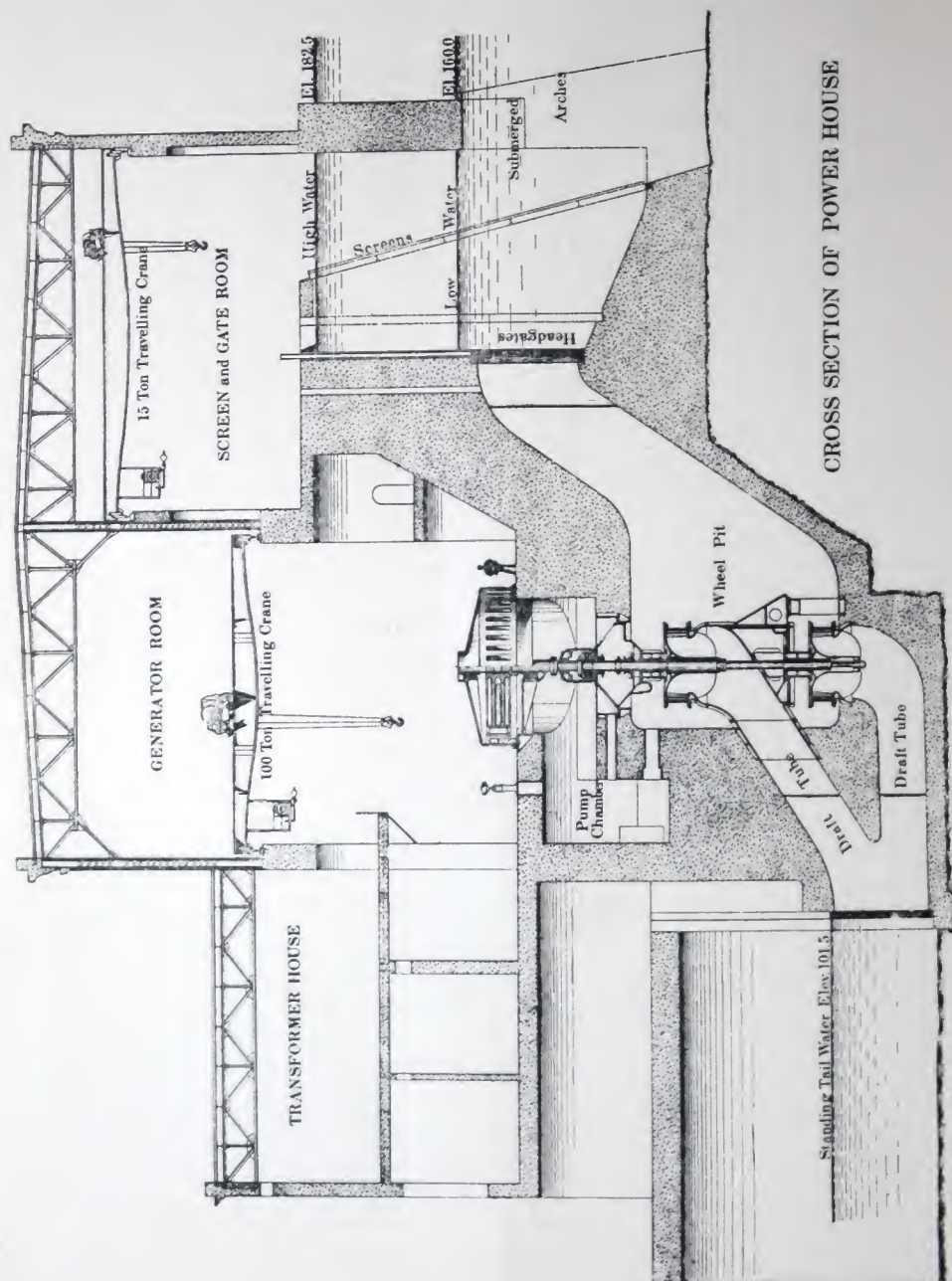


Generator Room, Holtwood,

Plant.

THE Hydro-electric plant of the Pennsylvania Water and Power Company is now completed and equipped with machinery for an initial electrical installation of 56,667 H. P., and provides space for an ultimate electrical capacity of 120,000 H. P. or more. There are five complete generating units now in operation. The Power House, Gate House and Transformer House are finished for six units, including rheostat and switchboard galleries, compartments for transformers and other apparatus. As the head works, foundations etc., are completed, the only work required to prepare the Power House for the full installation of 120,000 H. P. is the completion of the superstructure, a comparatively small amount of work, which can be carried out as required.

By careful engineering design it was found possible to install a water wheel unit of one-third greater output in the space originally designed for a unit of 13,500 horse power capacity, thus entailing considerable saving in cost of building, generating machinery, auxiliary apparatus, as well as operating cost. Owing to increase in demands for power, the sixth unit, which will be of this increased capacity, will be completed, including turbines, generator, etc., with an electrical capacity of 16,000 horse power during the coming year, so that by October 1912, we will have six units in operation, with a total electrical capacity of 72,667 horse power.



CROSS SECTION OF POWER HOUSE

Equipment.

THE water wheels are of the vertical type, each capable of developing 13,500 H. P. when operated at the minimum possible heads which will exist during extreme floods, and the generators are three phase, 25 cycle, 11,000 volts. The first three generators are of a capacity of 7,500 kilowatts, each; the next two generators are of a capacity of 10,000 kilowatts, each; and the sixth unit will be of a capacity of 12,000 kilowatts.

Each turbine has two runners, mounted above one another on a vertical shaft of forged steel. The entire weight of rotating parts of a turbine and generator is carried on a roller bearing supported by a heavy casting set into the masonry arch.

Huge steel head gates and tail gates with powerful electrically operated winches are provided for each unit.

The transformers, exciters, and pumps, as well as the water-wheels and generators, are of the most approved type and fully guaranteed. The I. P. Morris Company of Philadelphia built the water wheels and the generators were made by the General Electric Company, Schenectady; the transformers in the Baltimore Sub-Station were built by the Westinghouse Electric & Mfg. Co.

In the switch room, each high tension conductor is walled off from the adjacent conductor by barriers of concrete steel construction, and the 70,000 volt oil circuit breakers are housed in heavy concrete structures on a separate floor. Relays and buses are in duplicate and every precaution was taken to make the electric switching arrangement thoroughly safe and reliable. The switchboard is of the modern mimic bus type, situated in the center of the power station and overlooking the generator room and switch room, all circuit breakers and the various apparatus in the power house being electrically controlled with push buttons by the operator from this point; and here the operator, by means of intercommunicating telephones and colored signal lamps, is in touch with all parts of the building.



Steel Tower, with Strain Insulators used for Long Spans and to Anchor the Line at Angles



Steel Tower, with Suspension Insulators used in Straight Away Work

Transmission Line.

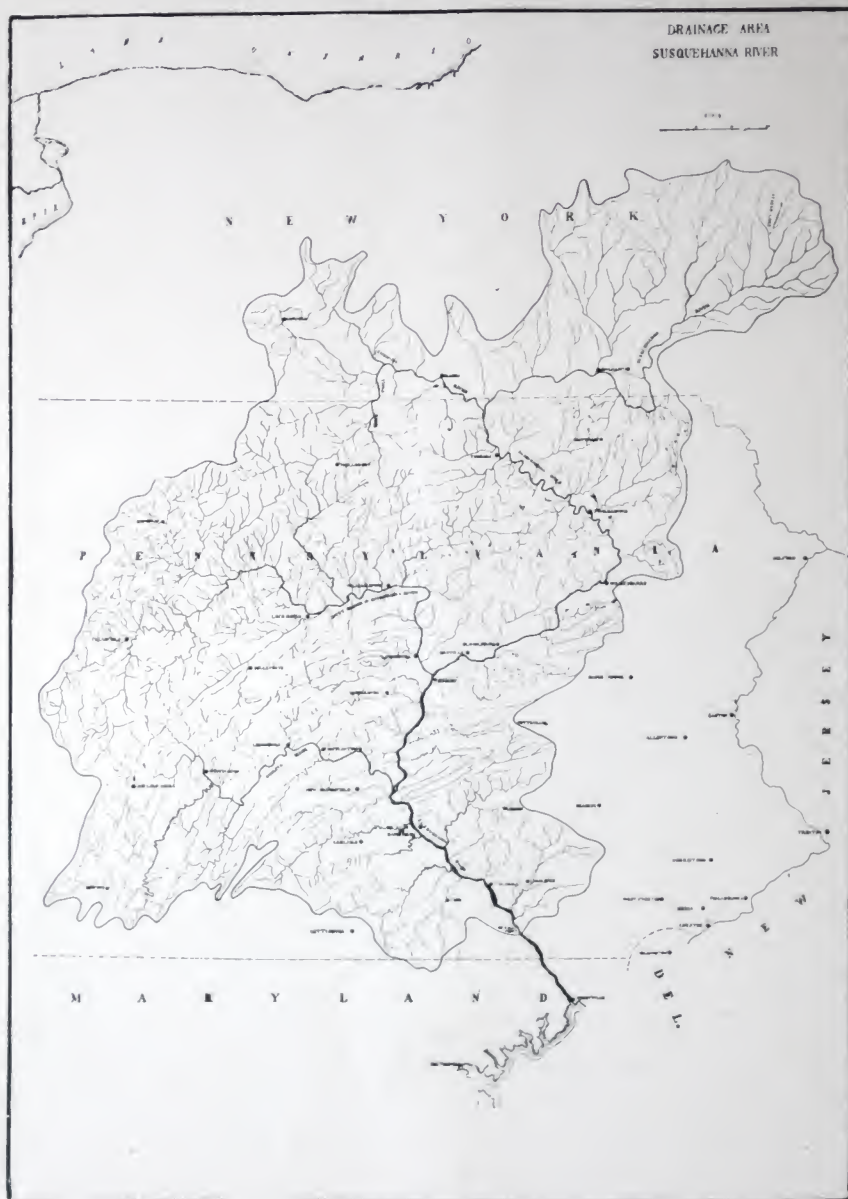
THE Company owns title to a right of way 100 feet wide and 40 miles long, extending from its plant at Holtwood, to the City of Baltimore. The Transmission Line represents the latest and most substantial form of electric transmission. The six lines of aluminum cable are suspended from over 400 steel towers ranging in height from 58 to 120 feet and the towers are so placed on the right of way that a duplicate line can be constructed when needed. A private telephone line is also installed the entire length of the line, so that the Power Plant, Patrol Stations and Baltimore Sub-Station are constantly in touch with each other. This line has been carrying 70,000 volts for more than a year and has most successfully withstood the severest tests of weather conditions.



Baltimore Sub-Station.

Baltimore Sub-Station.

THIS Station was designed and built by our own engineers. The foundation is entirely concrete—the walls are brick, the roof is of tiling and the interior partitions are concrete, making a most substantial and completely fireproof structure. It is equipped with Five Transformer Units and with the necessary auxiliary apparatus, giving a capacity to handle 65,000 H. P. of electric current. Provision is made for any increased demand for power, by providing space in the present building for additional apparatus necessary for one more unit of 13,000 H. P., and by extending the building an ultimate total capacity of over 100,000 H. P. can be obtained.



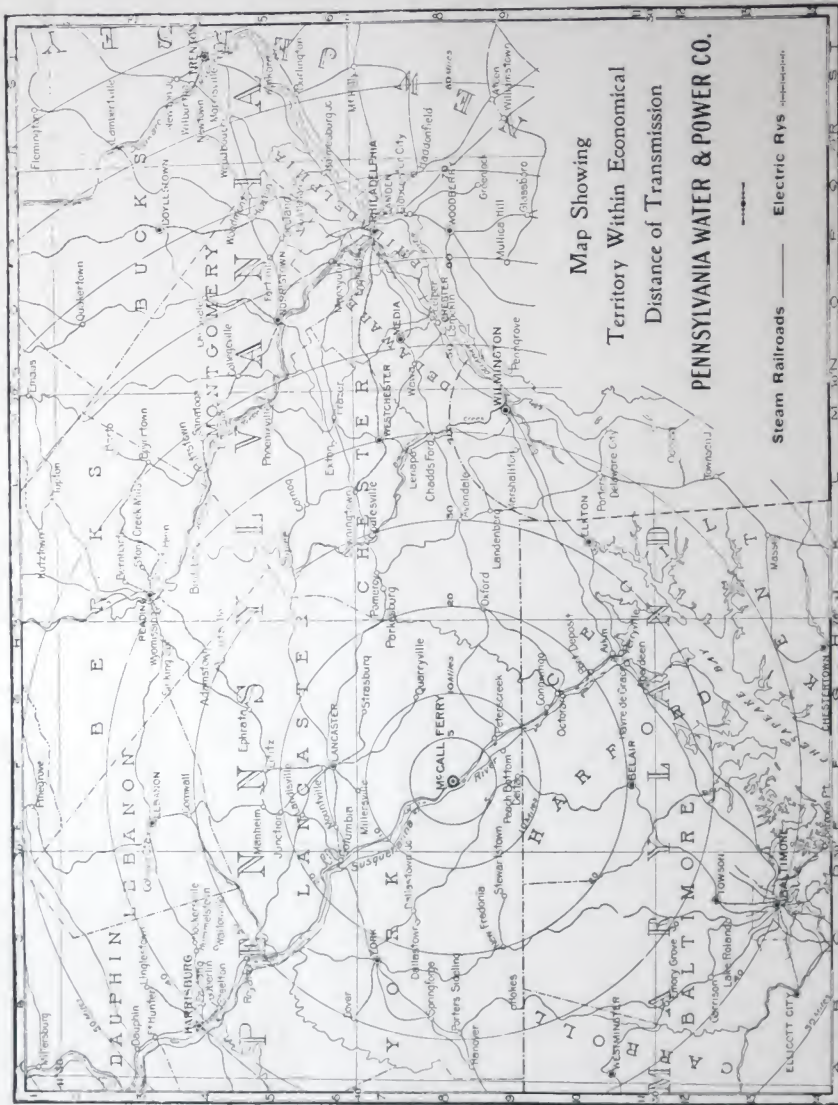
Operations of the Company.

BEGINNING service over its newly installed lines late in the year 1910, the Company has operated continuously during the intervening period with results that have demonstrated the efficiency of its installation and plant. Power has been delivered in large amount to the Consolidated Gas, Electric Light and Power Company, in Baltimore City and to the United Railways and Electric Company also operating there.

Of these Companies, the Consolidated Gas, Electric Light and Power Company controls practically all of the gas and electric business in the City of Baltimore and vicinity.

Our relations with this Company have been maintained on a most satisfactory basis and the result of the supply of electricity to the Consolidated Gas, Electric Light and Power Company has been to give to its business a great impetus, as shown by the fact that the increase in its electric consumption during the past year has been greater than ever before.

The contract with this Company provides, that if at any time the Power Company, by reason of a shortage of water, shall require to supplement its power, this can be accomplished by utilizing the steam plant of the Consolidated Gas, Electric Light and Power Company. This plant has a capacity of 32,000 H. P. and is kept constantly in an efficient state, whereby it can be operated instantly in case of emergency.



POPULATION OF PRINCIPAL CITIES.

PHILADELPHIA, 1,293,697	BALTIMORE, 603,000	WILMINGTON, 76,508
HARRISBURG, 50,167	YORK, 33,708	LANCASTER, 41,459

The United Railways and Electric Company of Baltimore.

THIS Company controls the entire tramways system in the City of Baltimore and surrounding country, having trackage in excess of 400 miles and operating more than 800 cars over its system. It represents the latest and most up-to-date practice in supplying transit facilities in a modern and thrifty American city.

The Pennsylvania Water and Power Company supplies practically the entire requirements of this Company, furnishing the energy which drives its cars over a territory within 17 miles of the City of Baltimore and carrying 155,000,000 passengers per year.

The United Railway and Electric Company also has at its command large steam capacity, which, under the terms of the contract with the Pennsylvania Water and Power Company, is available in case of emergency. It is interesting to note however, that this privilege has never been availed of since the inauguration of the power supply from the Susquehanna River.

By reason of the large demand upon our resources from these two Companies in Baltimore and actuated by a desire to render only first-class service, the Pennsylvania Water and Power Company has deemed it wise not to take on other contracts, but, as its plant is extended and its resources thereby increased, it is the intention of the management to expand its operations so as to take in other cities in the State of Pennsylvania and elsewhere.

New York, Jan. 1st, 1912

WILMINGTON, 76,508
LANCASTER, 41,450

POPULATION OF PRINCIPAL CITIES.
BALTIMORE, 609,000
YORK, 55,705

PHILADELPHIA, 1,293,697
HARRISBURG, 50,107

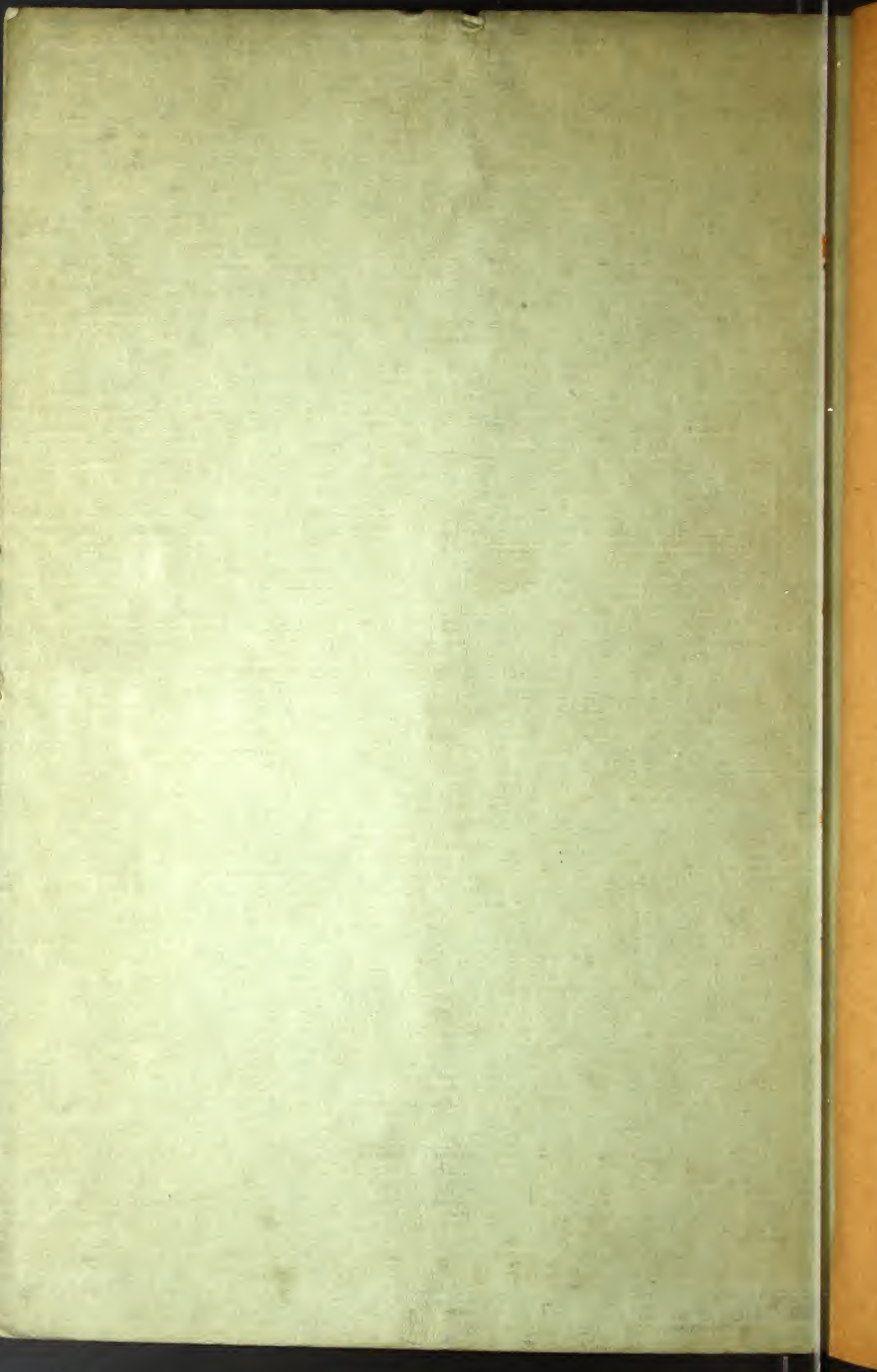
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